IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant	: Hongxin Song et al.	Art Unit	: 2112
Serial No.	: 10/600,419	Examiner	: Samir Wadie Rizk
Filed	: June 20, 2003	Conf. No.	: 6709
Title	: AVERAGING SIGNALS TO IMPROVE SIGNAL INTERPRETATION		

Mail Stop Appeal Brief - Patents
Commissioner for Patents
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REPLY BRIEF

Pursuant to 37 C.F.R. § 41.41, the following is in response to the Examiner's Answer dated January 23, 2009.

REMARKS

I. Rejection under 35 USC § 102(e): Rothberg fails to describe the claimed subject matter.

A. Claims 1, 2, 11, 12, 21-24, 26, 33-35, 45-46, 53-54, 63-68, 75 and 78: Rothberg fails to teach or suggest at least an error correction circuit responsive to the detector and the averaging circuit to provide a signal quality metric that governs which signals are averaged.

The Examiner's Answer dated January 23, 2009 fails to refute the arguments presented in the Appeal Brief and raises new points of contention.

Independent claim 1 recites in part "an error correction circuit responsive to the detector and the averaging circuit to provide a signal quality metric that governs which signals are averaged" (emphasis added). The Office asserts "that Rothberg [teaches a] quality metric that governs which signals are averaged as disclosed in Figure (4) and col. 4, lines (27-35)" and asserts "in figure 4 Rothberg teaches that bits 36_{N-2} and 36_N would not be averaged (would be erased) because each bit has reliability value of 0.4 (less than 0.5)" (Examiner's Answer, page 10). These assertions are respectfully traversed.

The Office assertion that "Rothberg's bits 36_{N-2} and 36_N would not be averaged" runs contrary to Rothberg's disclosure. Rothberg discloses (underlining added for emphasis):

> In one embodiment, the averaged values used to assign the binary value to each averaged binary bit is also used to generate an erasure pointer for increasing the number of errors corrected by the error correction code 30. This is illustrated in FIG. 4 which shows a reliability metric generated for each bit in the estimated data sequence 34. The reliability metric in this embodiment is computed as the averaged value if assigned a "1" bit, and computed as one minus the average value if assigned a "0" bit.

See Rothberg at col. 4 lines 27-35. Rothberg discloses an averaging operation as "a number of estimated data sequences 32_0 - 32_N averaged together to generate the estimated data sequence 34 comprising the averaged data bits" (col. 4, lines 1-4). In Rothberg's estimated data sequence 34,

the numbers under the individual bits represent Rothberg's reliability metrics. Rothberg's reliability metric is either the average value for said individual bit or one minus the average value for said individual bit (See Rothberg, above).

Further, all of Rothberg's estimated data sequences (32_0 - 32_4) in FIG. 4 are used to generate Rothberg's estimated data sequence 34. Each of these sequences in Rothberg, e.g., sequences (32_0 - 32_4), contain the 36_{N-2} to 36_N bit positions. The "+" between Rothberg's sequences (32_0 - 32_4) and the arrow to Rothberg's estimated data sequence 34 indicate that all of Rothberg's sequences (32_0 - 32_4) are used. Thus, the 36_{N-2} to 36_N bit positions in Rothberg's estimated data sequence 34 reflect averages of the corresponding bits in Rothberg's estimated data sequences (32_0 - 32_4).

Indeed, all of Rothberg's estimated data sequences are used as evidenced by the depiction of computed reliability metrics in Rothberg's FIG. 4. For example, consider the data shown in bit position 36_N are 0, 1, 0, 1, and 0 for respective estimated data sequences 32_0 - 32_4. The average value for bit position 36_N is 0.4 ((0+1+0+1+0)/5) which is the depicted reliability metric for bit position 36_N. In direct contradiction to Rothberg's disclosure, the Office asserts "Rothberg teaches that bits 36_{N-2} and 36_N would not be averaged (would be erased) because each bit has reliability value of 0.4 (less than 0.5)." Clearly, the Office's assertion does not logically follow from Rothberg's disclosure.

Because Rothberg's reliability metrics are each a result of an average, Rothberg's reliability metrics are not equivalent to the claimed signal quality metric that governs which signals are averaged.

Additionally, Rothberg discloses at "step 68 the target sector is read N times and the resulting read data averaged" (col. 8, lines 54-56). Similar to the previously cited portions of Rothberg, Rothberg uses all N of the read data. Rothberg fails to teach or suggest selective exclusion of read data when computing Rothberg's read data average. Thus, Rothberg fails to disclose an aspect that governs which signals are averaged.

Thus, based on the arguments above, the rejection of claims 1, 2 and 11 should be withdrawn, and these claims should be in condition for allowance.

Independent claim 12 should be allowable for at least similar reasons. Claim 12 recites in part "an error correction circuit responsive to the detector and the averaging circuit to provide a signal quality metric that governs which read signals are averaged" (emphasis added). The Office relies on Rothberg for this claimed subject matter, referring to the rejection of claim 1 when rejecting claim 12. (*See* 4-30-2008 Final Office Action at page 7.) Thus, for at least the reasons addressed above, Rothberg fails to teach or suggest an error correction circuit responsive to the detector and the averaging circuit to provide a signal quality metric that governs which read signals are averaged. Thus, based on the arguments above, the rejection of claims 12 and 21 should be withdrawn, and these claims should be in condition for allowance.

Independent claim 22 should also be allowable for at least reasons similar to claim 1. Claim 22 recites, among other things, "wherein interpreting the input signal comprises using maximum likelihood detection and error correction to provide the discrete values and a signal quality metric, the method further comprising excluding the input signal from the multiple signals to be averaged based on the signal quality metric" (emphasis added). The Examiner's Answer dated January 23, 2009 fails to refute the arguments presented in the Appeal Brief. Thus, based on the arguments above and those presented in the Appeal Brief, the rejection of claims 22-24, 26 and 33 should be withdrawn, and these claims should be in condition for allowance.

Independent claim 34 should also be allowable for at least reasons similar to claim 1. Claim 34 recites in part "wherein the means for reading further includes error-detection means for controlling which read signals are averaged " (emphasis added). The Office relies on Rothberg, and the rejection of claims 1 and 22, for this claimed subject matter. (*See* 4-30-2008 Final Office Action at pages 7 and 9.) Thus, the remarks above with respect to claims 1 and 22 are applicable to claim 34 as well. Therefore, based on the arguments above, the rejection of claims 34 and 35 should be withdrawn, and these claims should be in condition for allowance.

Independent claim 45 should also be allowable for at least similar reasons. Claim 45 recites in part "wherein the means for interpreting comprises maximum likelihood detection and error correction means for providing the discrete values and a signal quality metric used to exclude an input signal from averaging" (emphasis added). The Office relies on Rothberg, and the rejection of claims 1 and 22, for this claimed subject matter. (*See* 4-30-2008 Final Office Action at pages 7 and 9.) For at least reasons similar to those addressed above, Rothberg fails to teach or suggest a signal quality metric used to exclude an input signal from averaging. Thus, based on the arguments above, the rejection of claims 45, 46 and 78 should be withdrawn, and these claims should be in condition for allowance.

Independent claim 53 should also be allowable for at least reasons similar to claim 1. Claim 53 recites in part "means for providing a signal quality metric that governs which signals are averaged" (emphasis added). The Office relies on Rothberg and the rejection of claim 1, for this claimed subject matter, referring to the rejection of claim 1 when rejecting claim 53. (*See* 4-30-2008 Final Office Action at page 7.) Thus, the remarks above with respect to Rothberg are applicable to claim 53 as well. Therefore, based on the arguments above, the rejection of claims 53, 54 and 63 should be withdrawn, and these claims should be in condition for allowance.

Independent claim 64 should also be allowable for at least reasons similar to claim 45. Claim 64 recites in part "wherein interpreting the input signal comprises using maximum likelihood detection and error correction to provide the discrete values and a signal quality metric, and the operations further comprise excluding the input signal from the multiple signals to be averaged based on the signal quality metric" (emphasis added). The Office relies on Rothberg, and the rejection of claims 1 and 22, for this claimed subject matter. (*See* 4-30-2008 Final Office Action at pages 7 and 9.) For at least reasons similar to those addressed above, Rothberg fails to teach or suggest excluding the input signal from the multiple signals to be averaged based on the signal quality metric. Thus, based on the arguments above, the rejection of claims 64-68 and 75 should be withdrawn, and these claims should be in condition for allowance.

B. Claims 9, 10, 19, 20, 30-32, 43, 44, 52, 61, 62, 72-74, 76 and 77: Rothberg fails to teach or suggest at least a control circuit that determines whether the discrete values are adequately indicated based on comparison of interpretations of the new averaged signal and the current signal.

Independent claim 9 recites in part "wherein the control circuit determines whether the discrete values are adequately indicated based on comparison of interpretations of the new averaged signal and the current signal" (emphasis added). The Office cites Rothberg at FIG. 1B., reference character (18), FIG. 8, reference characters (68) and (72), and col. 8 lines (55-65) as teaching the control circuit feature of claim 9 (see 4-30-2008 Final Office Action at page 7). The Office cites Rothberg's FIG. 4 and col. 4, lines 1-27 as teaching the above identified wherein clause of claim 9 (*ibid*). The Examiner's Answer stated that "every limitation in claim 9 is rejected with specific reference to feature (step) in Rothberg, for example see item 9 in the final office action mailed on 4/30/2008 wherein several reference characters (steps) in Figure 1B has been pointed to each and every limitation in the claim 9" (pages 10-11).

To the contrary, Rothberg's FIG. 1B and FIG. 8 as well as corresponding sections of Rothberg's disclosure fail to teach the claimed subject matter. Rothberg discloses "If at step 18 a read error occurs, the disk controller 12 repositions the head over the selected data sector at step 19 to generate a second read signal" (col. 3, lines 37-39 and see FIG. 1B). Note that Rothberg fails to teach how the disk controller determines a read error. For FIG. 8, Rothberg discloses:

> If at step 64 a read error occurs, then at step 66 the disk controller 12 adjusts a tracking offset setting. At step 68 the target sector is read N times and the resulting read data averaged. At step 70 the averaged read data is processed in an attempt to recover the data sector. If at step 72 the data sector is still unrecoverable, and at step 74 there are more tracking offset settings to try, then the process reiterates starting with step 66.

See Rothberg at col. 8, lines 53-60. Here in the final paragraph of Rothberg's Description of the Preferred Embodiments, Rothberg still fails to teach how the disk controller determines a read

error. Moreover, Rothberg's fails to teach using interpretations of an averaged signal and a current signal for read error determination. Rothberg's FIG. 8 shows steps 68 and 70 which, respectively, averages read data and processes average read data to attempt to recover the data sector, and, thereafter, Rothberg's read error question step 72. Rothberg teaches the use of average data to recover the data sector. Rothberg completely fails to teach a comparison of interpretations of the new averaged signal and the current signal.

Thus, Rothberg completely fails to teach "the control circuit determines whether the discrete values are adequately indicated based on comparison of interpretations of the new averaged signal and the current signal." Thus, based on the arguments above, the rejection of claims 9, 10, 19, 20, 30-32, 43, 44, 52, 61, 62, 72-74, 76 and 77 should be withdrawn, and these claims should be in condition for allowance.

For all of the above reasons, Grounds of Rejection I should be overturned.

II. Rejection under 35 USC § 103(a): Takashi fails to cure the defects of Rothberg.

Takashi fails to describe the claimed subject matter addressed above with respect to Rothberg (see Appeal Brief, pages 22-23).

Therefore, based on the arguments presented above with respect to claim 1, the rejection of claims 3-6 and 8 should be withdrawn, and these claims should be in condition for allowance. Based on the arguments presented above with respect to claim 12, the rejection of claims 13-16 and 18 should be withdrawn, and these claims should be in condition for allowance. Based on the arguments presented above with respect to claim 22, the rejection of claims 25 and 29 should be withdrawn, and these claims should be in condition for allowance. Based on the arguments presented above with respect to claim 34, the rejection of claims 36-41 should be withdrawn, and these claims should be in condition for allowance. Based on the arguments presented above with respect to claim 45, the rejection of claims 47, 48 and 51 should be withdrawn, and these claims should be in condition for allowance. Based on the arguments presented above with respect to claim 53, the rejection of claims 55-58 and 60 should be withdrawn, and these claims should be

in condition for allowance. Finally, based on the arguments presented above with respect to claim 64, the rejection of claim 71 should be withdrawn, and this claim should be in condition for allowance.

In view of the arguments presented above, it is respectfully requested that ground of rejection II be overturned in its entirety.

For these reasons, and the reasons stated in the Appeal Brief, the final rejection should be reversed.

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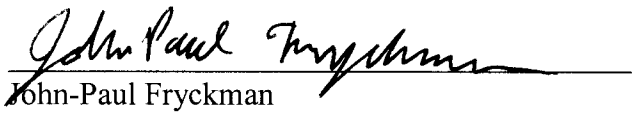
Respectfully submitted,

Date: 3/18/09



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